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The spillover effects of financial development and institutions on economic growth in emerging economies: New insights from spatial Durbin approach

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Abstract

Despite the extensive literature on the relationship between financial development (FD) and economic growth, previous studies have largely overlooked the potential spatial interdependence between countries. To address this gap, this paper employs spatial Durbin estimation that explicitly captures the spillover effects of FD and institutions on a panel dataset of 56 emerging countries over a 30-year period. The findings reveal a significant impact of FD on economic growth, although no evidence of its threshold effect. Institutions play a critical role in shaping the FD-growth relationship, with political institutions being the most influential in driving economic growth both within and across neighbouring countries. On the other hand, improvement in economic institutions moderates the growth-effect of FD. Financial institutions drive the within-country effect of FD on growth, while the spillover effect primarily stems from financial markets in neighbouring countries. The robustness of the findings is confirmed through a battery of tests. In conclusion, this empirical study offers valuable insights into the complex relationship between financial development, institutions, and economic growth in emerging countries. By considering spatial interdependencies and the role of institutions, policymakers can devise effective strategies to harness the positive effects of financial development and create an enabling environment for sustained and inclusive economic growth.

Keywords: Economic growth, spillover effect, financial development, institutional quality, spatial Durbin model..

JEL code: O16, O43, C31

I. Introduction and background

The relationship between financial development (FD) and economic growth has been extensively explored in the finance-growth literature.[1] However, the majority of previous studies have neglected to examine this relationship through the lens of spatial econometrics settings. Spatial econometrics offers a valuable approach for analysing the impact of FD on economic growth in the context of multiple interconnected countries. This is especially relevant given the increasing interaction between countries and the potential existence of spatial autocorrelation, akin to cross-sectional dependence, which can influence the growth process and the behaviour of growth determinants, including FD and institutions.

The following are among the most recent studies that employ a formal spatial econometrics analysis to investigate the effect of FD on several dependent variables of interest, their focus however has been limited to the context of intra-country analysis i.e. across provinces or counties within China: Wang et al. (2019) investigate the effect of FD on economic growth, Zhong & Li (2020) on green total factor productivity; Ran et al. (2020) on income inequality, and Zhu et al. (2021) on poverty. On the other hand, Samreen & Majeed (2020) and Khezri et al. (2021) conduct a multi-country spatial econometrics analysis, but their focus was not on economic growth; instead, they explore the effect of FD on carbon emissions in 89 countries and 31 Asia-Pacific countries, respectively. Additionally, Al-Barakani et al. (2022) investigate the influence of FD on ecological footprints in 57 Belt and Road Initiative (BRI) countries. Our study is naturally close to Ahmad & Law (2023), however theirs employs a spatial lag model only and primarily concentrates on examining the role of institutional proximities in shaping the current institutional environment and financial development, which consequently influences economic growth. In addition, they omit the spatial effects decomposition in their study.

Utilizing a 30-year panel dataset on 56 emerging and developing countries, we employ spatial econometrics analysis via spatial Durbin model (SDM) estimation to explicitly capture the spillover effects of FD and institutions between countries. The first variable of interest of this study is FD, and we aim to explore how the level of FD in neighbouring countries may exert spillover effect on the home country's growth. Theoretically, these spillover effects undoubtedly can manifest through various channels: firstly, a country's well-developed financial markets can positively influence the growth of neighbouring countries via policy imitation, leading to higher growth rates in these neighbouring economies; secondly, financial reforms in a particular country that attract more foreign direct investment or trade may create competitive pressure on other countries to adopt similar policies; and thirdly, the economic policy reforms, particularly those related to FD, in one country can change the information set on which policymakers base their decisions. Policymakers in another country, often lacking crucial information on the reform process, may learn from the experiences of their peers, thus influencing their own policy decisions. Considering this potential spillover effect is vital to providing a comprehensive understanding of the role of FD in driving economic growth across interconnected countries.

Secondly, we seek to examine the role of institutions in the relationship between FD and economic growth since the underlying assumption is that FD policymaking must be embedded within a strong institutional framework (Ahmad & Law, 2023; Law, et al., 2013; Law, et al., 2018). To capture this, we include an interaction term of FD and institutional quality variables in the growth model and examine their interaction effect with the aim to shed light on the importance of institutions in shaping the impact

[1] See the following meta-analysis studies; Qasemi (2019), Bijlsma et al. (2018), Arestis et al. (2015), Valickova et al. (2015), and Asongu (2015). Meta-analysis is a systematic review and quantitative synthesis of empirical economic evidence on a given hypothesis, phenomenon, or effect. It seeks both to summarize and explain the wide, often disparate, variation routinely found among reported econometric results (Stanley, 2001; and Havránek et al. 2020).

of FD on economic growth in emerging countries under study. The sample countries chosen for this study are limited to emerging and developing countries, following the International Monetary Fund (IMF) country classification. Focusing on countries with similar level of economic and financial development as well as institutional environments lowers the probability of sample heterogeneity that could distort the findings. Finally, the use of only geographical matrices in conceptualising the spatial dependence between countries allows a more objective interpretation of the spillover effects of FD and institutions originating from neighbouring countries onto the home country's economic growth.

The contributions of this study to the finance-growth literature are threefold: 1) firstly, on FD and institutions, we aim to show that the positive effect of FD on economic growth is empirically supported and there is a threshold level for the FD's growth-effect. We also seek to reinforce the earlier findings on the significant growth-effect of institutional quality, both in economic and political terms, through the inclusion of institutional quality variables in the analysis; 2) secondly, on the interplay between FD and institutions, we aim to demonstrate the importance of institutions in moderating the effect of FD on economic growth. Since there are two institutional quality variables included in the growth model, we seek to compare the relative importance of economic and political institutions in driving economic growth and their relative moderating roles on the effect of FD on growth; 3) finally, on decomposition of the growth-effects of FD and institutions, where via SDM estimation we seek to decompose the growth-effect of FD, institutions, and their interactions into direct (within country effect) and indirect (spillover effect from neighbours), eventually providing a comprehensive understanding of the complex interplay between FD, institutions, and economic growth in the sample emerging countries. Furthermore, with the use of FD sub-indicators namely financial institutions and financial markets development in the analysis, we aim to give a clearer insight into the channels of FD effects on growth.

Overall, the analysis confirms the significant impact of FD on economic growth, although no evidence of a threshold effect is found. Institutions play a critical role in shaping the FD-growth relationship, with political institutions being the most influential in driving economic growth both within and across neighbouring countries. Conversely, improvements in economic institutions are found to moderate the growth-effect of FD. Digging deeper, financial institutions drive the within-country effect of FD on growth, while the spillover effect primarily stems from financial markets in the neighbouring countries. The study's findings have important policy implications for policymakers in emerging countries, which will be discussed further in the conclusion section of this study.

The paper proceeds as follows, Section 2 discusses the empirical framework of the study that includes data and measurements, econometric model, spatial weight matrix, and empirical strategy; Section 3 discusses the results of baseline and robustness estimation; and Section 4 concludes with several policy implications.

II. Empirical Framework

A. Data and measurements

A panel dataset is used in this study consisting of observations from a period of 30 years beginning from 1990 to 2019 for 56 emerging and developing countries based on International Monetary Fund (IMF)[1] classification. Number of emerging and developing countries that are included in the sample is determined based on two criteria: firstly, any country must have at least one neighbour when specifying

[1] See more here: https://www.imf.org/en/Publications/WEO/weo-database/2023/April/groups-and-aggregates

the matrices, since this is a requirement to make the spatial econometrics analysis work. Secondly, it is a prerequisite that the dataset must have no missing observation whatsoever. All variables used in the study are collected in annual frequency and some variables do have missing observations, hence the reason they are converted into 5-year average.[1] Thus, there are six non-overlapping 5-year average periods used in this study, with total observations of 336. Summary statistics and pairwise corelation are reported in Appendix, see Table A1 and A2, respectively, whereas detailed information of the variables including definition, time-period, frequency, and sources of dataset is presented in Table A3, and sample countries in Table A4.

The variable of interest of this study is FD and institutions variables. For FD variable, *Financial Development index* from the International Monetary Fund (The IMF, 2019) is used; it is a comprehensive measure that captures the depth, access, and efficiency of two scopes of financial development, namely financial institutions (FI) and financial markets (FM).[2] Meanwhile, the institutional quality variables that capture the institutional environment of a country are two: *Law and Order* from International Country Risk Guide dataset (The PRS Group, 2017) – to represent the level of economic institutions (henceforth *EI*); and *Polity 2* from Polity V dataset (Marshall & Gurr, 2020) – to capture the level of political institutions (*PI*).

To test for robustness of the baseline results, several tests are used. Firstly, two alternative variables are used for the *EI* namely *Rule of Law* from the Worldwide Governance Index (The World Bank, 2020) and *Corruption* from the ICRG (The PRS Group, 2020). The two alternative variables tor *PI* are *Polcon 3* from the Political Constraints Index (Henisz, 2017), and *Checks* from the Database of Political Institutions 2020 by Cesi et al., (2021). Secondly, while retaining the baseline institutional variables *Law and Order* and *Polity 2*, three additional control variables are added into SDM estimation namely *human capital* (proxied by human capital index obtained from Penn World Table, see Feenstra et al., 2015), and *trade openness* and *inflation* (obtained from World Development Indicators, The World Bank, 2020); all three have been well-documented in the literature to be among the significant growth determinants. The final robustness test, and to clearly identify the channel of spatial effect of FD on growth, two sub-indicators for the two FD scopes namely *Financial Institutions* (FI) and *Financial Markets* (FM) are used in the SDM estimation in place of the overall FD index. The two indicators are also obtained from International Monetary Fund (The IMF, 2019).

B. Econometric model and effects decomposition

i. The spatial Durbin model (SDM)

To begin our empirical analysis on the spatial effects of FD and institutional quality on growth, the following theoretical growth model with country specific fixed effect is considered:

$$growth_{it} = \alpha_i + X_{it}\beta + \varepsilon_{it} \quad (1)$$

where $growth_{it}$ is the average growth rate of real GDP per capita in region *i* measured over five-year periods, *X* is a vector of independent variables including the variable of interests FD and institutions, as well as a set of other growth determinants commonly used in previous literature (such as initial income,

[1] If a country has severe missing observations, say, it has no observations for more than five consecutive years, hence preventing the averaging process, it is also excluded. Another reason for using 5-year average data is that such data are able to eliminate yearly fluctuations in the countries' growth process, since the changes in financial development and institutions are undoubtedly more pronounced over a longer period than annually.

[2] IMF's FD index summarizes how developed financial institutions and financial markets are in terms of their depth (size and liquidity), access (ability of individuals and companies to access financial services), and efficiency (ability of institutions to provide financial services at low cost with sustainable revenues and the level of activity of capital markets).

investment, and population growth). α stands for the unobservable country-specific effects and ε is the corresponding disturbance term.

At this point it is important to note that our theoretical model in Equation (1) above does not provide a specific spatial specification to be estimated, and as is usual in the traditional growth literature, the model assumes all countries as isolated units, ignoring the spatial characteristics of the data and the potential role geography in shaping economic growth (Rey & Janikas, 2005). The omission of the potential spatial correlation between the countries in the growth modelling may lead to misspecification and inconsistent estimations. Thus, we begin by considering a fixed-effects spatial Durbin model (SDM) which is sufficiently general to allow for different types of spatial interactions between the sample countries, and Equation (1) therefore can be rewritten as follows:

$$growth_{it} = \alpha_i + \rho W growth_{it} + X_{it}\beta + WX_{it}\theta + v_{it} \quad (2)$$

where *W* is the spatial weight matrix capturing the degree of spatial dependence between the various countries, and *v* is the disturbance term. In this specification, the growth rates of a country depend on the spatial lag of the dependent variable, $Wgrowth_{it}$, whose spatial effects are captured via rho (ρ) working through the dependent variable. In addition, the model also includes the spatial lags of regressors, *WX* that captures the spillover effects of the neighbours' growth-determinants towards the country's growth.

The presence of spatial lags of the dependent and explanatory variables complicates the interpretation of the parameters in Equation (2) (Le Gallo et al., 2003; Anselin et al., 2008). Therefore, some caution is required when interpreting the estimated coefficients in the SDM. As shown by LeSage & Pace (2009, pp. 33–42), in an SDM, not only a change in a particular explanatory variable in country *i* has a direct effect on that country, but also an indirect effect on the remaining countries.

Nevertheless, the specification in Equation (2) is a better starting point because the SDM allows one to estimate consistently the effect of FD and institutions on country's economic growth when endogeneity is induced by the omission of a (spatially autoregressive) variable. Indeed, LeSage & Pace (2009) show that if an unobserved or unknown but relevant variable following a first-order autoregressive process is omitted from the model, the SDM produces unbiased coefficient estimates. The SDM also does not impose prior restrictions on the magnitude of potential spillover effects. Furthermore, the SDM is an attractive starting point for spatial econometric modelling because it includes as special cases two alternative specifications widely used in the literature namely the spatial lag model (SLM) and the spatial error model (SEM). Hence. the SDM in Equation (2) can be simplified to the spatial lag model when $\theta = 0$:

$$growth_{it} = \alpha_i + \rho W growth_{it} + X_{it}\beta + v_{it} \quad (3)$$

and to the spatial error model if $\theta + \rho\beta = 0$:

$$growth_{it} = \alpha_i + X_{it}\beta + \epsilon_{it} \quad (4)$$

where $\epsilon_{it} = \varphi W \epsilon_{it} + v_{it}$ and v_{it} is i.i.d error term. In fact, the SDM model produce unbiased coefficient estimates even when the true data-generation process is an SLM or SEM.

ii. The growth model:

The following equation expands Equation (1) into a full growth model based on Barro (1991) with right-hand-side regressors comprising of FD and institutions as the variables of interest:

$$growth_{it} = \alpha_i + \beta_1 FD_{it} + \beta_2 FD_{it}^2 + \beta_3 EI_{it} + \beta_4 PI_{it} + \beta_5 (FD * EI)_{it} + \beta_6 (FD * PI)_{it} + X'\beta + \varepsilon_{it} \quad (5)$$

where:

$growth_{it}$	:	the average growth rate of GDP per capita in country i (measured over 5-year interval),
FD_{it}	:	*Financial Development* index,
FD^2_{it}	:	*Financial Development* index squared (to capture its threshold effect on growth),
EI_{it}	:	economic institutions variable,
PI_{it}	:	political institutions variable,
X'	:	other growth determinants; *Initial real GDP per capita* (in natural log form, to capture the convergence process), *Investment*, and *Population growth*. Also, other additional control variables included later in the robustness check,
α_i	:	the unobserved country-specific effects, and
ε_{it}	:	the corresponding disturbance term where $\varepsilon \sim N(0, \sigma^2 I)$.

iii. Direct, indirect, and total effects:

As is previously discussed in the Introduction section, among the main objectives of this paper is to investigate the distinctive role of institutional factors in the nexus between FD and growth. Equation (5) explicitly captures this via by the inclusion of the interaction term between FD and both types of institutions. The total effect of FD on economic growth can therefore be gauged by taking partial derivative of *growth* with respect to *FD*:

$$\frac{\delta growth}{\delta FD} = \beta_1 + 2\beta_2 FD + \beta_5 EI + \beta_6 PI \quad (6)$$

Equation (6) above shows that the effect of FD on economic growth is represented by the sum of the coefficients above, at the same time depending on the value of FD, and economic and political institutions indicators.

Consequently, the SDM of Equation (5) can be rewritten as the following:

$$\begin{aligned} growth_{it} = {} & \alpha_i + \beta_1 FD_{it} + \beta_2 FD_{it}^2 + \beta_3 EI_{it} + \beta_4 PI_{it} + \beta_5 (FD * EI)_{it} + \beta_6 (FD * PI)_{it} + X'\beta + \\ & \rho W growth_{it} + \theta_1 WFD_{it} + \theta_2 WFD_{it}^2 + \theta_3 WEI_{it} + \theta_4 WPI_{it} + \theta_5 W(FD * EI)_{it} + \\ & \theta_6 W(FD * PI)_{it} + WX'\theta + v_{it} \end{aligned} \quad (7)$$

The countries' spatial interdependence captured in the SDM model of Equation (7) above subsequently expands the size of the total effect of FD on economic growth since the partial derivative of *growth* with respect to FD is now comprises of two components namely within-country effects of FD and institutions (direct effect), as well as the spillover effects of FD and institutions from neighbouring countries (indirect effect). The following partial derivative outlines these two components:

$$\frac{\delta growth_i}{\delta FD_i} = \beta_1 + 2\beta_2 FD + \beta_5 EI + \beta_6 PI + \theta_1 + 2\theta_2 FD + \theta_5 EI + \theta_6 PI \quad (8)$$

which can be rearranged to:

$$\frac{\delta growth_i}{\delta FD_i} = (\beta_1 + \theta_1) + 2FD(\beta_2 + \theta_2) + EI(\beta_5 + \theta_5) + PI(\beta_6 + \theta_6) \quad (9)$$

The sole purpose of the partial derivative in Equation (9) above is to clearly illustrate the decomposition of spatial effects of FD and institutions on growth into direct and indirect effects. To simplify the illustration, a partial derivative of a dependent variable (y) with respect to any vector of regressor (x_k) can be obtained as:

$$\Gamma = {}^{\partial y}/_{\partial x_k} = (I - \rho W)^{-1} \begin{bmatrix} \beta_k & w_{12}\theta_k & . & w_{1n}\theta_k \\ w_{21}\theta_k & \beta_k & . & w_{2n}\theta_k \\ . & . & . & . \\ w_{n1}\theta_k & w_{n2}\theta_k & . & \beta_k \end{bmatrix} \quad (10)$$

where ρ is the indirect effect from spatially lagged dependent variable, β_k is the direct effect of explanatory variable *k*, and θ is the indirect effect from spatially lagged explanatory variable *k*, and the effect depends on the size of w_{ij}.

Thus, referring to Equation 9 and 10 above, direct effect (or within-country effect), which is captured via β coefficients, can be interpreted as the average change in the economic growth rate of a particular country caused by a one-unit change in that country's explanatory variables. In turn, indirect effect (or spillover effect from neighbouring countries), which is captured via θ coefficients, is interpreted as the aggregate impacts on the growth rate of a particular country propagated by the changes in an explanatory variable originating from all other (neighbouring) countries. Finally, the total effect is the sum of the direct and indirect effects. Nevertheless, since the β and θ coefficients in Equation (9) and (10) is a vector of coefficients, the computation of the magnitude of the direct and indirect effects must be made based on the average value of the variable in in question in examining the size of its growth-effect, holding other variables constant (see Elhorst, 2010, pp. 18-20 for more discussion on the decomposition of effects in spatial model).

C. Spatial weights matrix

Considered by Corrado & Fingleton (2012) as a critical issue in spatial econometric modelling, a spatial weight matrix, *W*, must be defined before the spatial model in Equation (2) can be estimated. The spatial weight matrix conceptualises the spatial dependence between the countries, and in this paper, we construct various geographical weight matrices based on the concept of binary contiguity, *k*-nearest neighbours, binary distance, and inverse distance. The following are definition of the matrices:

Matrix types:		**Definition:**
Binary contiguity	:	First-order contiguity matrix where countries are defined as neighbours if they are physically adjacent or sharing common borders. Its element $w_{ij} = \begin{cases} 1 \text{ if } i \text{ and } j \text{ are contiguous} \\ 0 \text{ if otherwise} \end{cases}$
k-nearest neighbours	:	Three matrices are constructed whose *k* is set to be either 5-, 10-, or 15-nearest neighbours, beyond which the spatial dependence is assumed to be negligible. Its element $w_{ij} = \begin{cases} 1 \text{ if } j \in N_k(i) \\ 0 \text{ if otherwise} \end{cases}$, where *k* is the number maximum regions, either 5, 10, or 15.

Binary distance : Three matrices are constructed, whose cut-off distance is set to be either 1600, 2000, or 2500 km. 1600 is the minimum cut-off which guarantees each country in the sample will have at least one neighbour.

Its element $w_{ij} = \begin{cases} 1 \text{ if } d_{ij} \leq \bar{d} \\ 0 \text{ if otherwise} \end{cases}$, where $\bar{d}$ is the critical distance cut off points either 1600, 2000, or 2500 km.

Inverse distance ($d_{ij}^{-\alpha}$) : Inversed distance matrix is given by:

$$w_{ij} = d_{ij}^{-\alpha} / \sum_j d_{ij}^{-\alpha} \text{ if } d_{ij}^{-\alpha} \leq \overline{d^{-\alpha}}$$

where d_{ij} is the Great Circle distance between the capitals of country i and j, $\bar{d}$ is the critical cut-off distance beyond which spatial effect is considered negligible i.e. $w_{ij} = 0$ if $d_{ij}^{-\alpha} > \overline{d^{-\alpha}}$. The cut-off distance is set at 1600 km following the similar reason as in the binary distance matrix above.

The α is set to be either $\alpha = 1.00$ (inverse distance), $\alpha = 1.25$, $\alpha = 1.50$, $\alpha = 1.75$ and $\alpha = 2.00$ (inverse squared distance) hence making altogether five inverse distance matrices.

The distance calculation for all matrices except binary contiguity is done via Great Circle distance computation using latitude and longitude coordinates of the countries' capitals (Le Gallo & Ertur, 2003).[1] All twelve matrices above conceptualising the geographical interdependence between the developing countries under study are strictly exogenous to the model, and this is consistent with the recommendation by Anselin & Bera (1998) allowing us to avoid the identification problems raised by Manski (1993). Following the convention in spatial econometrics analysis, all the matrices are row standardized, so that it is relative, and not absolute, distance that matters. Finally, the most appropriate matrix that best describe the data is selected based on several criteria namely residual variance, log-likelihood function value, and Akaike Information Criterion (AIC) value.[2] As is seen in Table 1 below, 10-nearest neighbour matrix is selected as the most appropriate matrix and is therefore used in the estimation of SDM in the rest of this paper.[3]

<<<Insert Table 1 here>>>

D. Empirical strategy

The empirical analysis begins by conducting tests for cross-sectional dependence (CSD) using Pesaran's CD tests (Pesaran, 2004; Pesaran, 2015, 2021) to capture the cross-sectional (or spatial) correlation between the countries in the sample. Once CSD is confirmed, we proceed with fixed effect estimation

[1] The Great Circle distance between countries' capitals reflects the shortest distance between any two points on the surface of a sphere measured along a path on the surface of the sphere (as opposed to going through the sphere's interior). See more on http://en.wikipedia.org/wiki/Great-circle_distance.

[2] Elhorst et al., (2013) suggest selecting model with the lowest parameter estimate of residual variance. Meanwhile, Elhorst (2010) and Stakhovych & Bijmolt (2009) show that the higher LLF values the better is the spatial model. On the other hand, the convention also indicates that the lower the AIC value, the better fit is the model.

[3] This is supported by the sample of 56 emerging countries which can be segregated into several regions and each region comprises of more than 10 countries as is seen in Table A4 in Appendix.

of the non-spatial model (Equation 1) with Driscoll & Kraay (1998) standard errors, which are robust to heteroskedasticity, serial correlation, and CSD. The purpose of this non-spatial fixed effect estimation is purely for comparison with previous studies that explored the interlinkage between FD, institutions, and growth without using spatial methods.

To further validate the presence of CSD, we examine spatial autocorrelation in the residuals of the ordinary least squares (OLS) estimation of Equation (2) using Moran's *I* test. If spatial autocorrelation is detected, we proceed to estimate the general form of the spatial model using SDM, as depicted in Equation (2). To determine the preferred spatial model, we employ Elhorst's (2010) Likelihood Ratio (LR) tests, comparing the alternative specifications to SDM. Firstly, we conduct an LR test between SDM and Spatial Lag Model (SLM), testing the null hypothesis of no spillover effects from growth-determinants in neighbouring countries (i.e., H_0: $\theta = 0$). Secondly, we perform an LR test between SDM and Spatial Error Model (SEM), testing the null hypothesis that all coefficients for spatially lagged terms (spatially lagged growth and spatially lagged growth-determinants) in the equation are equal to zero (i.e., H_0: $\theta + \rho\beta = 0$). If both null hypotheses are rejected, we consider the SDM as the preferred model. If any of the LR tests fail to reject the null hypothesis, we then use the LM tests (both non-robust and robust versions) developed by Anselin et al., (1996) to determine the preferred spatial model between SLM and SEM. Subsequently, we discuss the baseline results of the preferred estimation model, followed by the decomposition of the effects of FD and institutions on growth.

To ensure the robustness of the baseline results, we conduct three robustness tests. Firstly, we use alternative institutional variables for Economic Institutions (EI) namely *Rule of Law* and *Corruption*, to replace the baseline variable *Law and Orde*r. For Political Institutions (PI), we utilize Political Constraint Index *Polcon 3* and *Checks* as alternatives to the baseline variable *Polity 2*. We create four combinations of EI and PI by pairing the baseline PI with the two alternative EI variables, and the baseline EI with the two alternative PI variables. Secondly, we introduce additional control variables into the baseline model, namely *human capital*, *trade openness*, and *inflation*, which are widely recognized as significant determinants of economic growth in existing literature. Lastly, we delve deeper into the spatial effects of FD on economic growth by using sub-indicators of FD index namely *Financial Institutions* (FI) and *Financial Markets* (FM).

These robustness tests serve to strengthen the validity of our findings and provide a more comprehensive understanding of the relationship between FD, institutions, and economic growth in the emerging countries. The inclusion of alternative institutional variables, additional control variables, and the exploration of specific FD sub-indicators allow us to investigate various dimensions of the spatial effects and their implications for economic growth. By employing these rigorous methodologies, we aim to present a well-rounded and academically rigorous analysis in our investigation of the complex dynamics between financial development, institutions, and economic growth in a multi-country context.

III. Discussion of results

A. Non-spatial fixed effect estimation and spatial model selection

The first column of Table 2 displays the results of the non-spatial fixed effects estimation of Equation (5) with Driscoll & Kraay (1998) standard errors, which are robust to cross-sectional dependence (CSD). The findings align with the stylized facts about neoclassical growth, showing the presence of a conditional convergence process in the countries' growth, as well as the significant steady-state determinants, namely investment and population growth. The results also exhibit the expected positive

effects of FD and institutions on economic growth. Consistent with the previous finance-growth literature, the effect of FD on growth follows an inverted U-shape; the positive FD impact becomes negative after a specific threshold (indicated by the negative coefficient of FD^2). Additionally, the results find that the positive growth-effect of FD diminishes as the institutional environment improves (evidenced by the negative coefficients of the interaction terms FD*EI and FD*PI, albeit only the former being statistically significant at the 10% level).

Results of non-spatial fixed effects are presented only for comparison purpose since they are potentially biased due to the presence of spatial autocorrelation in the model, although the bias may be mitigated with Driscoll & Kraay (1998) correction technique that gives CSD-robust standard errors. It is also worth noting that fixed effects estimation effectively addresses the issue of omitted variable bias and endogeneity arising from unobserved heterogeneity in the error term. Nevertheless, the primary focus of this study is on spatial growth estimation to investigate the spillover effects of FD on economic growth.

Further reinforcing the earlier finding of CSD, significant results from the Moran's *I* test provide evidence of spatial autocorrelation (see Table 3), necessitating the use of spatial estimation for Equation (5). Columns 2 to 4 of Table 2 present the estimated results of three spatial model specifications, namely SDM, SLM, and SEM. To determine the most appropriate model, Likelihood Ratio (LR) tests are conducted between SDM and each of the simpler versions, SLM and SEM. The first LR test between SDM and SLM yields a significant p-value, rejecting the null hypothesis (H_0: $\theta = 0$), thus indicating that SDM is preferred over SLM. Similarly, the second LR test between SDM and SEM also rejects the null hypothesis (H_0: $\theta + \rho\beta = 0$), favouring SDM over SEM. As SDM is deemed the most appropriate model, Lagrange Multiplier tests for SEM (LM test – SEM) and for SLM (LM test – SLM), along with their robust versions, are no longer applicable, as these tests are meaningful only when the LR tests point to models other than SDM (Elhorst, 2010). Lastly, considering the residual variance, log-likelihood function (LLF) value, and Akaike Information Criterion (AIC) value, SDM exhibits the lowest residual variance and AIC values, as well as the highest LLF value among the three spatial models. These findings further support the suitability of SDM over SLM and SEM for capturing the spatial effects of FD and institutions on economic growth in the sample emerging countries.

<<<Insert Table 2 and Table 3 here>>>

B. Baseline SDM result discussion

Since SDM is the preferred spatial model, our discussion of baseline result will focus solely on the SDM estimation. The results of SLM and SEM can still be referred for comparison against the previous studies that employed similar spatial models. In the SDM estimation, the within-country effects are captured through β coefficients, while the spillover effects from neighbouring countries are represented by θ coefficients (as seen in Equation 7). One important caveat, however, is that correct interpretation of the parameter estimates in the SDM model necessitates considering the direct, indirect, and total effects associated with change in the regressors. To provide a comprehensive understanding, the size of these effects for each regressor is presented in Table 4 below. However, for the discussion of SDM results in Table 2, we will focus on examining the sign and significance level of the regressors' effects on growth, both within-country and from neighbouring countries.

Consistent with existing evidence in the finance-growth literature, the SDM estimation results in Table 2 confirm that FD significantly impacts economic growth, with its coefficient being statistically

significant at the 1% level. While the negative coefficient of FD^2 aligns with theoretical expectation of the U-shape effect of FD on growth, it is found to be statistically insignificant. Thus, our finding does not support the existence of an FD threshold effect on growth, a result frequently reported in the literature. Overall, with the exception of threshold effect of FD, our finding corroborates the majority of the previous studies on the significant effect of finance on growth, such as Law & Singh (2014), Law, et al. (2013), and Law (2018) to name a few.

Regarding the institutional quality variables, only Political Institutions (PI) variable i.e. *Polity 2* is found to be a significant determinant of economic growth, with significance level of 5%. This finding is similar to that of Ahmad & Hall (2022) and Ahmad (2019) and lends more credence to the proposition of political prominence theory put forth by Acemoglu et al. (2005) over the property rights institutions suggested by North (1990). Meanwhile, the interaction terms between FD and institutions, FD*EI and FD*PI, are introduced to investigate the moderating effect of institutional quality on the relationship between FD and growth. Both interaction terms exhibit negative coefficients, indicating that the positive effect of FD on growth diminishes as institutional quality improves. In other words, in countries with high (low) quality institutional environments, be it economically or politically, the positive growth-effect of FD becomes less (more) impactful. However, only the FD*EI term is found to be statistically significant at the 1% level, suggesting that policymakers in emerging economies should prioritize the level of economic institutions when formulating financial development policies.

Lastly, the SDM estimation results provide strong evidence of a conditional convergence process in the growth of the sample countries. Additionally, the steady-state determinants, namely investment and population growth, have significant growth-effects, further contributing to the understanding of the economic dynamics in the studied countries.

Moving on to the spillover effects across countries captured by SDM, we observe the coefficients of ρ (the spatially lagged growth) and θ (spatially lagged explanatory variables) in Table 2. The positive coefficient of ρ is significant at the 10% level, indicating the presence of positive growth spillover between the studied emerging countries. Interestingly, when comparing the results with SLM estimation (column 3), a larger coefficient of ρ is obtained with a stronger significance level at 1%. This is because SLM assumes that the spillover effects of spatially lagged explanatory variables do not exist and are solely restricted to work via the growth channel. On the other hand, SDM relaxes the assumption of no spillover effects from explanatory variables, resulting in a smaller coefficient of ρ and weaker significance level due to the presence of significant spillover effects from several regressors, as discussed below.

Among the θ coefficients capturing the spillover effect of spatially lagged explanatory variables, several are found to be significant at the 1% level. These include a positive spillover effect from neighbours' FD^2 and political institutions, a FD-growth moderating effect of neighbours' political institutions, and negative spatial externalities of population growth and spatially lagged initial GDP per capita, the latter supporting the concept of spatial conditional convergence across the emerging countries in the sample. However, as previously stated in the caveat, the correct interpretation of these parameter estimates in the SDM model requires consideration of the size of direct, indirect, and total effects resulting from changes in the growth determinants.

<<<Insert Table 4 here>>>

To discuss the estimated direct, indirect, and total effects presented in Table 4, we use the mean values of the relevant variables obtained from summary statistics and refer to Equation 9 for effect computation. As shown in Table 4, the positive growth-effect of FD is moderated by the negative spillover from neighbours' FD levels. On average, the mean FD value of 0.243 is expected to exert a net negative effect on economic growth, reducing growth by approximately 4.5% (i.e. 0.243*-18.455), while holding other factors constant. However, it is important to note that the spillover effect of FD is found to be insignificant; hence, when only the positive effect of FD is accounted for, it raises growth by approximately 5.8% (0.243*23.925) on average. As for FD^2, both the spillover effect and the total effect are significant at the 1% level. Consequently, on average, the net spillover effect of FD^2 is expected to raise growth by almost 55% (i.e. 2*0.243*113.144), while holding other factors constant. Taken together, these results indicate that the spillover effect of FD on growth is roughly 10 times the effect of the within-country effect of FD. This outcome is not surprising given the selection of the 10-nearest neighbour matrix as the most appropriate spatial matrix for conceptualizing the dependence between these emerging countries.

Furthermore, *Polity 2* emerges as a robust growth determinant, with both the direct and indirect effects of the political institutions variable being significant at the 5% and 1% levels, respectively. Consistent with its higher significance level, the indirect (or spillover) effect of *Polity 2* is found to be much larger than the within-country effect. On average, the mean *Polity 2* value of 3.452 is expected to raise growth by 2.4% (i.e. 3.452*0.694), holding other factors constant.

Regarding the moderating effect of institutions on the FD-growth relationship, our findings show that the economic institutions' moderating effect is confined within the country, while the political institutions' moderating effect solely propagates from neighbours. Both moderating effects are significant at the 1% level. However, the result reveals that the within-country economic institutions have a larger moderating effect than that of the neighbours' political institutions. These findings may suggest that greater consideration of the home country's economic institutions is essential when formulating financial development policies, while acknowledging that neighbouring countries' political environments may also play a role.

Finally, several other results are also noteworthy. There is a negative total effect of population growth on economic growth, and the negative spatial externalities of population growth outweigh its within-country effect. The results also support the conditional convergence hypothesis, and the spatial convergence process is shown to be nearly twice as significant as the within-country convergence process, indicating that these emerging countries indeed follow a similar development path over the long run (see Abreu et al., 2005; Arbia et al., 2010; Ahmad & Hall, 2017; and Ahmad, 2019 for further discussion on spatial convergence process).

C. Robustness checks

In the first robustness test of the baseline results, we conducted alternative SDM estimations by using two different variables for each scope of institutions, Economic Institutions (EI) and Political Institutions (PI). The two alternative EI variables, *Rule of Law* and *Corruption*, were included alternately in the SDM estimation model, paired with the baseline PI variable, *Polity 2* (estimations 5 and 6 in Table 5). Similarly, the two alternative PI variables, *Polcon 3* and *Checks*, were included alternately, paired with the baseline EI variable, *Law and Order* (estimations 7 and 8). The results of these estimations are presented in Table 5.

<<<Insert Table 5 here>>>

From the results in Table 5, it is evident that when using alternative EI variables, estimation 5 with *Rule of Law* variable closely mirrors the baseline estimation results vis-à-vis the spillover effect of FD and the significant spatially lagged growth (at the same 10% level). However, the within-country effect of FD loses its significance compared to the baseline. Since the baseline political institutions variable *Polity 2* is retained, its significant within-country and spillover effects on growth continue, and it is the same case for the moderating effect of neighbours' political institutions. As for estimation 6 using *Corruption*, the only similarity to the baseline is the significant spillover effect of FD, while its within-country effect now becomes insignificant. Similarly, the within-country and spillover effects of the baseline PI variable, *Polity 2*, are no longer significant in both estimations 6 and 7. Additionally, the moderating effect of neighbours' political institutions and the spatially lagged growth are also found to be insignificant in these estimations.

Moving on to estimations using the alternative PI variables, both estimation 7 and 8 yield better results than estimations 5 and 6, especially concerning the growth effects of FD (within-country and spillover effects) and the alternative political institutions. Both the alternative political institutions variables, *Polcon 3* and *Checks*, have significant spillover effects, but only *Polcon 3* has a significant within-country effect. Estimation 8, using the *Checks* variable, exhibits a significant moderating effect of neighbours' political institutions and the spatially lagged growth, matching the baseline findings. Furthermore, the baseline EI variable, *Law and Order*, remains insignificant in terms of its individual effect on growth, but its moderating effect on the FD-growth relationship remains significant, albeit with a lower level of significance, closely resembling the baseline results. In summary, the key finding in the first robustness test is that the spillover effect of FD is consistently present and significantly affects the growth process, regardless of the alternative economic or political institutions variables used.

Results of the second robustness test are presented in Table 6. One crucial finding of this test is that both the within-country and spillover effects of FD consistently remain significant, at least at the 5% level, across all four different estimations; either in the first three estimations when additional control variables namely *human capital*, *trade openness*, and *inflation* are included individually into the baseline model (estimations 9 to 11), or in the last estimation when all three variables are included concurrently into the general model (estimation 12). For the first three estimations, the overall results are almost identical to those of the baseline estimation. However, in the general model estimation, apart from the significant effect of the FD variable, the results indicate no significant spillover effect from other growth determinants.

<<<Insert Table 6 here>>>

In order to gain a deeper understanding of the mechanisms or channels through which FD affects economic growth, we further explore the individual components of the FD index, which measures the overall development of a country's financial institutions and financial markets in terms of their depth, access, and efficiency. To do this, we focus on two sub-indicators of the FD index: *Financial Institutions* (FI) and *Financial Markets* (FM) and include them in the baseline SDM estimations. The results of these estimations, as well as the effects decomposition, are reported in Table 7 and Table 8, respectively.

<<<Insert Table 7 and Table 8 here>>>

Building upon the earlier findings from the baseline SDM estimation, which indicated significant within-country and spillover effects of FD on growth, this third robustness check provides further insights. It becomes evident that the within-country effect of FD on growth is mainly driven by the development of financial institutions, as the FI variable shows significance at the 1% level (estimation 13). Conversely, the influence of financial markets on the within-country effect of FD is found to be insignificant (estimation 14). On the other hand, concerning the spillover effect of FD, it appears to be predominantly generated by the development of financial markets in neighbouring countries. This observation is supported by the high significance of FM and FM^2 in estimation 14, further corroborated by the significant indirect effect of FM and FM^2 as presented in Table 8.

Similar to the baseline results, political institutions continue to exhibit significant within-country and spillover effects on growth, once the development of financial markets is controlled for (when FM variable is used). However, when the FI variable is employed, only the spillover effect of political institutions remains significant. Additionally, the results show a marginally significant moderating effect of economic institutions (within-country) and political institutions (from neighbouring countries) in the relationship between financial institutions and growth. However, such moderating effects do not hold significance in the relationship between financial markets and growth. Notwithstanding, referring to the decomposed effects in Table 8, it becomes evident that the moderating effect of institutions, whether economic or political, is no longer significant.

To summarize the key finding from this third robustness check, we observe that the within-country effect of FD on growth is primarily driven by the development of financial institutions, while its spillover effect mostly stems from the development of financial markets in neighbouring countries. These findings provide valuable insights into the differential impact of financial institutions and financial markets on economic growth, shedding light on the channels through which FD influences growth dynamics.

IV. Concluding Remarks

Via spatial Durbin analysis on a panel of 56 countries over a 30-year period, this study sheds light on the complex relationship between FD, institutions, and economic growth in the selected emerging countries. The findings provide valuable insights into the key determinants of economic growth and offer important policy implications for policymakers in these nations.

Overall, the analysis confirms the previous findings in the finance-growth literature on the significant impact of FD on economic growth. While the relationship between FD and growth follows an inverted U-shape pattern, the study did not find significant evidence to support this threshold effect. Nevertheless, it underscores the importance of maintaining a delicate balance in promoting FD to maximize its positive growth impact.

Furthermore, the study reveals the critical role of institutions in shaping the relationship between FD and economic growth. Political Institutions (PI) emerge as the most influential institutional quality variable in driving economic growth in the sample countries, be it within the country or via a spillover to the neighbouring countries. This highlights the significance of political stability, effective governance, and regulatory frameworks in fostering sustained economic development. The interaction between FD and institutions also proves crucial, with improvements in institutional quality, especially the economic institutions, moderating the growth-effect of FD. Policymakers must consider these

interdependencies when formulating financial and institutional policies to enhance economic growth prospects.

The study delves deeper into the channels through which FD affects economic growth by examining the sub-indicators of the FD index. Financial Institutions (FI) are found to be the main driver of the within-country effect of FD on growth, while the spillover effect primarily stems from the development of Financial Markets (FM) in neighbouring countries. This highlights the distinct roles played by financial institutions and financial markets in contributing to overall economic growth. Policymakers should consider these differential impacts when devising strategies to promote FD and harness its positive influence on economic growth.

In light of these findings, policymakers in emerging countries should adopt a comprehensive approach to economic development. Enhancing FD policies, including measures to promote financial access, depth, and efficiency, must go hand in hand with efforts to strengthen institutional frameworks. Transparency, accountability, and the rule of law are vital for creating an enabling environment that supports economic growth. Moreover, given the significant spillover effects of FD from neighbouring countries, regional cooperation and coordination are critical. Policymakers should work together to ensure the stability and positive impact of financial development policies across borders.

In conclusion, this empirical study provides valuable insights for policymakers seeking to foster sustained and inclusive economic growth in emerging countries. By understanding the nuanced relationships between financial development, institutions, and economic growth, policymakers can craft effective strategies to capitalize on the positive effects of financial development while addressing potential challenges. Implementing targeted and well-balanced policies will be crucial to unlocking the full growth potential of these economies and promoting prosperity for their populations.

Table 1: Spatial weights matrix selection criteria

Matrix types:	Residual variance	Log-likelihood function (LLF)	Akaike Information Criterion (AIC)
Binary contiguity	2.669	-643.211	1326.423
5-nearest neighbour	2.588	-638.884	1317.767
10-nearest neighbour	2.490	-630.638	1301.276
15-nearest neighbour	2.596	-638.668	1317.335
Binary distance cut-off 1600 km*	2.567	-638.230	1316.460
Binary distance cut-off 2000 km	2.546	-637.288	1314.575
Binary distance cut-off 2500 km	2.576	-637.253	1314.505
Inverse distance ($d_{ij}^{-\alpha}$), α = 1.00	2.568	-638.206	1316.413
Inverse distance ($d_{ij}^{-\alpha}$), α = 1.25	2.570	-638.231	1316.462
Inverse distance ($d_{ij}^{-\alpha}$), α = 1.50	2.572	-638.286	1316.572
Inverse distance ($d_{ij}^{-\alpha}$), α = 1.75	2.574	-638.359	1316.718
Inverse squared distance ($d_{ij}^{-\alpha}$), α = 2.00	2.577	-638.453	1316.906

Note: minimum cut-off distance set at 1600 km that ensures each country in the sample has at least one neighbour. To obtain the residual variance, LLF, and AIC values, Equation (5) is estimated via spatial Durbin model using the respective matrices.

Table 2: Baseline estimation results for non-spatial and spatial fixed-effects estimations

Estimation model	Non-spatial Fixed Effects[#]	Spatial Durbin Model (SDM)		Spatial Lag Model (SLM)	Spatial Error Model (SEM)
		Within-country effect[^]	Neighbours' effect[^]		
	(1)	(2)		(3)	(4)
FD	25.648**	24.394***	-40.384*	24.787***	29.169***
	(10.574)	(7.507)	(23.608)	(7.087)	(7.195)
FD^2	-13.752**	-9.653	103.878***	-14.739**	-20.662***
	(5.425)	(7.086)	(22.267)	(6.931)	(7.029)
Baseline EI – *Law and Order*	0.621*	0.467	-0.582	0.576*	0.526*
	(0.357)	(0.313)	(1.042)	(0.318)	(0.314)
Baseline PI – *Polity 2*	0.162***	0.121**	0.461***	0.105*	0.097*
	(0.018)	(0.057)	(0.146)	(0.057)	(0.058)
FD*EI	-2.826*	-2.984***	-0.096	-2.787**	-2.993***
	(1.644)	(1.098)	(4.041)	(1.097)	(1.067)
FD*PI	-0.043	-0.082	-1.752***	0.079	0.147
	(0.048)	(0.201)	(0.668)	(0.195)	(0.194)
Initial real GDP per capita	-2.891***	-4.400***	-5.707***	-2.805***	-3.072***
	(0.314)	(0.701)	(2.097)	(0.549)	(0.608)
Investment	0.155***	0.159***	0.089	0.148***	0.152***
	(0.023)	(0.024)	(0.081)	(0.024)	(0.025)
Population growth	-0.548***	-0.677***	-2.616***	-0.482**	-0.412**
	(0.041)	(0.211)	(0.810)	(0.209)	(0.207)
ρ (Spatial lag growth)			0.181*	0.351***	
			(0.098)	(0.079)	
φ (Spatial error term)					0.445***
					(0.081)
Country-specific effects	Yes	Yes		Yes	Yes
Time-specific effects	Yes	Yes		Yes	Yes
Number of countries	56	56		56	56
Observations	336	336		336	336
Adjusted R-squared	0.172	0.097		0.165	0.131
Residual variance	-	2.490***		2.791***	2.715***
LLF	-	-630.638		-651.733	-648.870
AIC	-	1301.276		1325.465	1319.739

[#] Non-spatial fixed effect estimation with Driscoll & Kraay (1998) standard errors that are robust to heteroskedasticity, serial correlation and cross-sectional dependence, the latter is tested to be present via Pesaran (2004) and Pesaran (2015, 2021) CD tests.
[^] For SDM, within-country effect gives the β coefficients, and neighbours' effect the θ coefficients – see Equation (7).
Note: The dependent variable is Real GDP per capita growth rate. Standard errors in parentheses. ***, ** and * indicate significant level at 1%, 5% and 10% respectively. All spatial models are estimated using 10-nearest neighbour matrix.

Table 3: Moran's *I* test and model specification tests for spatial estimation using 10-nearest neighbour matrix

Type of tests:	Statistics	p-value
Moran's *I*	10.384	0.000
LM test – SEM	135.577	0.000
Robust LM test – SEM	123.183	0.000
LM test – SLM	18.307	0.000
Robust LM test – SLM	5.913	0.015
Likelihood Ratio (LR) test – SDM vs. SLM	44.230	0.000
Likelihood Ratio (LR) test – SDM vs. SEM	37.960	0.000

Note: Likelihood ratio test is based on Elhorst (2010) testing procedure to determine whether SDM can be reduced into a more simplified spatial model either SLM or SEM.

Table 4: Direct, indirect, and total effects from the baseline estimation of SDM

Variables:	Direct effect	Indirect effect	Total Effect
FD	23.925***	-42.380	-18.455
	(7.808)	(28.698)	(30.990)
FD^2	-7.901	121.045***	113.144***
	(7.172)	(25.859)	(27.442)
Baseline EI – *Law and Order*	0.483	-0.522	-0.039
	(0.305)	(1.278)	(1.370)
Baseline PI – *Polity 2*	0.129**	0.565***	0.694***
	(0.054)	(0.159)	(0.173)
FD*EI	-3.046***	-0.893	-3.940
	(1.051)	(4.821)	(5.224)
FD*PI	-0.109	-2.096***	-2.205**
	(0.200)	(0.812)	(0.885)
Initial real GDP per capita	-4.519***	-7.591***	-12.109***
	(0.714)	(2.562)	(2.672)
Investment	0.160***	0.146	0.306***
	(0.024)	(0.093)	(0.100)
Population growth	-0.713***	-3.254***	-3.967***
	(0.206)	(0.997)	(1.064)

Note: Standard errors in parentheses. ***, ** and * indicate significant level at 1%, 5% and 10% respectively.

Table 5: Robustness check 1 – SDM estimation with alternative economic and political institutions

Estimation model	**SDM** with alternative EI1 – *Rule of Law*		**SDM** with alternative EI2 – *Corruption*		**SDM** with alternative PI1 – *Polcon 3*		**SDM** with alternative PI2 – *Checks*	
	Within-country effect	Neighbours' effect	Within-country effect	Neighbours' effect	Within-country effect	Neighbours' effect	Within-country effect	Neighbours' effect
	(5)		(6)		(7)		(8)	
FD	9.067 (6.295)	-37.614** (18.218)	10.568 (7.348)	-69.346*** (21.956)	21.442*** (7.593)	-61.607*** (20.210)	20.030*** (7.403)	-40.179** (18.833)
FD^2	-2.453 (7.248)	97.765*** (23.392)	-3.648 (7.169)	120.486*** (23.744)	-7.519 (7.117)	122.292*** (21.356)	-8.827 (7.162)	108.786*** (21.452)
Baseline EI – *Law and Order*					0.305 (0.315)	-2.070* (1.117)	0.467 (0.316)	-1.188 (1.047)
Alternative 1 EI – *Rule of Law*	0.193 (0.767)	-2.961 (2.722)						
Alternative 2 EI – *Corruption*			-0.010 (0.337)	-0.802 (1.027)				
Baseline PI – *Polity 2*	0.114* (0.060)	0.559*** (0.152)	0.095* (0.057)	0.180 (0.143)				
Alternative PI1 – *Polcon 3*					3.935** (1.577)	14.955*** (4.281)		
Alternative PI2 – *Checks*							-0.102 (0.198)	1.788*** (0.454)
FD*EI	-3.995 (2.775)	-2.405 (9.849)	-0.920 (1.278)	-1.485 (3.813)	-2.091* (1.081)	4.789 (3.980)	-2.481** (1.086)	2.737 (3.881)
FD*PI	-0.009 (0.207)	-1.755*** (0.654)	0.031 (0.192)	-0.321 (0.582)	-8.246 (5.873)	-32.107 (19.639)	0.223 (0.539)	-5.345*** (1.413)
ρ (Spatial lag growth)		0.164* (0.098)		0.118 (0.103)		0.118 (0.102)		0.176* (0.098)
Country-specific effects	Yes		Yes		Yes		Yes	
Time specific effects	Yes		Yes		Yes		Yes	
Number of countries	56		56		56		56	
Observations	336		336		336		336	
Adjusted R-squared	0.093		0.073		0.089		0.083	
Residual variance	2.515***		2.517***		2.484***		2.524***	
LLF	-632.224		-632.110		-629.893		-632.906	
AIC	1304.448		1304.219		1299.786		1305.811	

Note: Refer Table 2 note for more information about the SDM estimation. For brevity reason, the estimated coefficients and standard errors for initial real GDP per capita, investment, and population growth variables are not reported.

Table 6: Robustness check 2 – SDM estimation with additional control variables

Estimation model	**SDM** With additional control: *Human capital index*		**SDM** With additional control: *Trade openness*		**SDM** With additional control: *Inflation*		**SDM** With additional control: All three variables	
	Within-country effect	Neighbours' effect	Within-country effect	Neighbours' effect	Within-country effect	Neighbours' effect	Within-country effect	Neighbours' effect
	(9)		(10)		(11)		(12)	
FD	22.559***	-54.980*	24.186***	-38.900	22.533***	-38.414	20.396**	-55.476*
	(7.890)	(30.704)	(7.682)	(23.682)	(7.537)	(23.513)	(8.116)	(31.079)
FD^2	-8.423	119.165***	-9.875	99.655***	-9.421	105.404***	-8.257	116.451***
	(7.385)	(25.811)	(7.190)	(23.132)	(7.053)	(22.176)	(7.467)	(26.335)
Baseline EI – *Law and Order*	0.468	-0.722	0.472	-0.496	0.425	-0.509	0.441	-0.507
	(0.313)	(1.079)	(0.314)	(1.048)	(0.314)	(1.065)	(0.314)	(1.095)
Baseline PI – *Polity 2*	0.110*	0.369*	0.117**	0.426***	0.116**	0.470***	0.097*	0.285
	(0.058)	(0.197)	(0.057)	(0.157)	(0.057)	(0.148)	(0.059)	(0.224)
FD*EI	-2.921***	0.623	-2.977***	-0.451	-2.633**	-0.715	-2.582**	-0.252
	(1.112)	(4.347)	(1.111)	(4.066)	(1.109)	(4.080)	(1.136)	(4.353)
FD*PI	-0.053	-1.582**	-0.075	-1.692**	-0.107	-1.746**	-0.048	-1.287
	(0.204)	(0.771)	(0.201)	(0.679)	(0.204)	(0.703)	(0.210)	(0.870)
ρ (Spatial lag growth)		0.174*		0.169*		0.179*		0.159
		(0.100)		(0.100)		(0.098)		(0.102)
Country-specific effects	Yes		Yes		Yes		Yes	
Time specific effects	Yes		Yes		Yes		Yes	
Number of countries	56		56		56		56	
Observations	336		336		336		336	
Adjusted R-squared	0.085		0.100		0.098		0.088	
Residual variance	2.476***		2.487***		2.465***		2.448***	
LLF	-629.649		-630.355		-628.914		-627.657	
AIC	1303.297		1304.709		1301.827		1307.313	

Note: Refer Table 2 note for more information about the SDM estimation. For brevity reason, the estimated coefficients and standard errors for initial real GDP per capita, investment, and population growth variables as well as all additional controls are not reported.

Table 7: Robustness check 3 – SDM estimation using sub-indicators of FD

Estimation model	SDM using *Financial Institutions* variable - FI		SDM using *Financial Markets* variable - FM	
	Within-country effect	Neighbours' effect	Within-country effect	Neighbours' effect
	(13)		(14)	
FI (estimation 13) or FM (estimation 14)	18.078***	-25.619	-0.187	-72.479***
	(6.785)	(23.736)	(6.276)	(25.221)
FI^2 or FM^2	-9.233	16.799	5.134	112.583***
	(6.875)	(27.448)	(6.891)	(25.162)
Baseline EI – *Law and Order*	0.534	-1.923	0.067	-0.613
	(0.395)	(1.410)	(0.229)	(0.617)
Baseline PI – *Polity 2*	0.028	0.373**	0.150***	0.407***
	(0.068)	(0.171)	(0.047)	(0.131)
FI*EI or FM*EI	-2.184*	7.677	-0.723	0.878
	(1.193)	(5.233)	(0.830)	(2.920)
FI*PI or FM*	0.339	-1.190*	-0.148	-0.734
	(0.218)	(0.639)	(0.161)	(0.557)
ρ (Spatial lag growth)		0.346***		0.191**
		(0.086)		(0.096)
Country-specific effect	Yes		Yes	
Time-specific effects	Yes		Yes	
Number of countries	56		56	
Observations	336		336	
Adjusted R-squared	0.159		0.032	
Residual variance	2.610***		2.575***	
LLF	-640.365		-636.338	
AIC	1320.729		1312.675	

Note: Refer Table 2 note for more information. For brevity reason, the estimated coefficients and standard errors for initial real GDP per capita, investment, and population growth variables are not reported.

Table 8: Direct, indirect, and total effects from SDM estimation using sub-indicators of FD

Estimation	***Financial Institutions* (FI)** (13)			***Financial Markets* (FM)** (14)		
Variables	**Direct effect**	**Indirect effect**	**Total Effect**	**Direct effect**	**Indirect effect**	**Total Effect**
FI (estimation 13) FM (estimation 14)	17.472**	-27.081	-9.609	-1.586	-87.198***	-88.784**
	(7.374)	(36.000)	(39.566)	(6.732)	(31.736)	(35.212)
FI^2 (13) FM^2 (14)	-9.079	16.810	7.731	7.304	136.483***	143.788***
	(7.568)	(41.887)	(46.194)	(7.166)	(30.812)	(33.755)
Baseline EI – *Law and Order*	0.477	-2.586	-2.109	0.073	-0.689	-0.617
	(0.401)	(2.095)	(2.289)	(0.219)	(0.774)	(0.806)
Baseline PI – *Polity 2*	0.042	0.543**	0.585**	0.159***	0.516***	0.675***
	(0.065)	(0.241)	(0.262)	(0.046)	(0.150)	(0.165)
FI*EI (13) FM*EI (14)	-1.901	10.474	8.573	-0.714	0.868	0.155
	(1.218)	(7.757)	(8.455)	(0.790)	(3.542)	(3.807)
FI*PI (13) FM*PI (14)	0.305	-1.543	-1.237	-0.160	-0.919	-1.079
	(0.224)	(0.975)	(1.077)	(0.162)	(0.688)	(0.745)

Note: Standard errors in parentheses. ***, ** and * indicate significant level at 1%, 5% and 10% respectively.

Abbreviations:

AIC: Akaike Information Criterion; CD or CSD: Cross-sectional Dependence; EI: Economic Institutions; FD: Financial Development; FI: Financial Institutions; FM: Financial Markets; GDP: Gross domestic product; ICRG: International Country Risk Guide; IMF: International Monetary Fund; LLF: Log likelihood function; LM: Lagrange Multiplier; LR: Likelihood Ratio; PI: Political Institutions; SDM: Spatial Durbin Model; SLM: Spatial Lag Model; SEM: Spatial error model.

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Appendix

Table A1: Summary statistics of all variables

Variable		Mean	Standard Deviation	Minimum	Maximum	Observations
Real GDP per capita growth	overall	2.118	2.535	-7.937	10.883	N = 336
	between		1.633	-1.020	8.537	n = 56
	within		1.949	-6.542	9.125	T = 6
FD	overall	0.243	0.146	0.032	0.715	N = 336
	between		0.137	0.065	0.560	n = 56
	within		0.054	0.052	0.419	T = 6
Law and Order	overall	3.089	0.994	1	5.983	N = 336
	between		0.829	1.633	4.883	n = 56
	within		0.558	1.461	4.968	T = 6
Polity 2	overall	3.452	5.874	-10	10	N = 336
	between		5.318	-10	10	n = 56
	within		2.578	-6.981	11.252	T = 6
Rule of Law	overall	-0.359	0.538	-2.231	1.379	N = 336
	between		0.490	-1.186	1.093	n = 56
	within		0.230	-1.404	1.006	T = 6
Polcon 3	overall	0.283	0.182	0	0.722	N = 336
	between		0.139	0	0.532	n = 56
	within		0.119	-0.121	0.635	T = 6
Corruption	overall	2.488	0.744	0.5	5	N = 336
	between		0.461	1.461	3.901	n = 56
	within		0.586	0.839	4.321	T = 6
Chekcs	overall	2.877	1.518	1	17	N = 336
	between		1.133	1	8.133	n = 56
	within		1.019	-1.257	11.743	T = 6
Investment	overall	22.216	6.581	3.958	49.729	N = 336
	between		5.218	12.214	37.379	n = 56
	within		4.061	10.407	36.714	T = 6
Initial Real GDP per capita	overall	4,582.056	4,637.818	215.548	22,955.240	N = 336
	between		4,511.543	358.518	21,323.670	n = 56
	within		1,207.943	-1,280.443	9,736.014	T = 6
Population growth	overall	1.837	1.050	-1.240	7.126	N = 336
	between		0.946	-0.803	4.090	n = 56
	within		0.470	-0.531	4.873	T = 6
Human capital index	overall	2.156	0.510	1.069	3.163	N = 336
	between		0.472	1.140	2.977	n = 56
	within		0.201	1.639	2.816	T = 6
Trade openness	overall	72.443	37.148	15.566	221.517	N = 336
	between		34.773	23.159	173.796	n = 56
	within		13.743	14.681	138.085	T = 6
Inflation	overall	21.600	120.358	-3.273	1,677.410	N = 336
	between		48.679	1.799	288.822	n = 56
	within		110.235	-261.873	1,410.188	T = 6

Table A2: Correlation matrix between variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Real GDP per capita (1)	1												
FD (2)	0.245*	1											
Law and Order (3)	0.170*	0.304*	1										
Polity 2 (4)	0.140*	0.214*	-0.177*	1									
Rule of Law (5)	0.168*	0.516*	0.542*	0.331*	1								
Corruption (6)	-0.011	0.154*	0.321*	0.108*	0.444*	1							
Polcon 3 (7)	0.172*	0.190*	-0.163*	0.610*	0.172*	-0.013	1						
Checks (8)	0.065	0.080	-0.181*	0.602*	0.085	-0.029	0.488*	1					
Investment (9)	0.365*	0.304*	0.256*	-0.133*	0.158*	-0.023	-0.057	-0.157*	1				
Population growth (10)	-0.316*	-0.461*	0.012	-0.391*	-0.227*	-0.101	-0.297*	-0.206*	-0.144*	1			
Human capital (11)	0.191*	0.601*	0.081	0.435*	0.436*	0.088	0.229*	0.220*	0.207*	-0.575*	1		
Trade openness (12)	0.070	0.141*	0.174*	-0.023	0.250*	-0.035	-0.076	-0.132*	0.298*	-0.048	0.309*	1	
Inflation (13)	-0.071	-0.178*	-0.076	0.069	-0.093	0.171*	0.017	0.046	-0.144*	-0.003	-0.112*	-0.205*	1
Initial Real GDP per capita (14)	-0.069	0.592*	0.132*	0.273*	0.432*	0.157*	0.116*	0.108*	0.153*	-0.410*	0.679*	0.167*	-0.075

Table A3: Variables definition and data sources

Variable name	Definition	Time period	Data frequency*	Sources
Growth, financial development, and steady-state determinants:				
Real GDP per capita growth	Annual percentage growth rate of GDP per capita constant 2010 U.S. dollars.	1990-2019	5-year average	World Development Indicators
Financial development index	Summarizes how developed financial institutions and financial markets are in terms of their depth (size and liquidity), access (ability of individuals/companies to access financial services), and efficiency (ability of institutions to provide financial services at low cost and with sustainable revenues and the level of activity in capital markets).	1990-2019	5-year average	International Monetary Fund
Initial GDP per capita	In natural log	1990-2019	First year of the 5-year period	World Development Indicators
Population growth	Annual population growth rate	1990-2019	5-year average	World Development Indicators
Investment	Gross fixed capital formation (% of GDP)	1990-2019	5-year average	World Development Indicators
Additional control variables:				
Human capital	Human capital index - Human capital index, based on years of schooling (Barro and Lee, 2010) and assumed returns, based on Mincer equation estimates around the world.	1990-2019	5-year average	Penn World Table (Feenstra et al., 2015)
Trade openness	Trade, i.e. the sum of exports and imports of goods and services, as % of GDP	1990-2019	5-year average	World Development Indicators
Inflation	Annual percentage of GDP deflator	1990-2019	5-year average	World Development Indicators
Institutions (economic and political institutions variables):				
Baseline: Law and order	Law is the strength and impartiality of the legal system, while Order is an assessment of popular observance of the law (0-6) lower score higher risk	1990-2017	5-year average (last period 3-year average)	International Country Risk Guide

Alternative 1: Rule of law	The perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. (Scores -2.5 to 2.5), higher values better	1996-2019	5-year average	World Development Indicator (World Bank Governance Index^)
Alternative 2: Corruption	Corruption within the political system and becoming a threat to foreign investment. (0-6) lower score higher risk	1990-2017	5-year average (last period 3-year average)	International Country Risk Guide
Baseline: Polity 2	The polity score is a polity scale ranges from +10 (strongly democratic) to -10 (strongly autocratic). -10 to + 10	1990-2019	5-year average	Polity V dataset (Marshall and Gurr, 2020)
Alternative 1: Political constraint index – Polcon 3	An index that demonstrates political environments that limit the feasibility of policy change, and these environments are an important determinant of investment in infrastructure (Score 0 to 1)	1990-2019	5-year average	Political Constraint Index dataset (Henisz, 2017)
Alternative 2: Checks	Checks and balance score rating (0-18)		5-year average	Database of Political Institutions (Cesi, et al, 2021)

*Data are collected annually from the original sources. 5-year average data are based on authors' own computation. and imputing zero to the blank observations are therefore not expectedcause

Table A4: Emerging and developing countries (IMF classification*)

Emerging and Developing Asia (11 countries)	Latin America and the Caribbean (19 countries)	Middle East and Central Asia / Emerging Developing Europe (9 countries)	Sub-Saharan Africa (17 countries)
China	Argentina	Algeria	Botswana
Indonesia	Bolivia	Bahrain	Cote d'Ivoire
Mongolia	Brazil	Bulgaria	Cameroon
Malaysia	Chile	Iran	Congo
Philippines	Colombia	Jordan	Gabon
Thailand	Costa Rica	Morocco	Ghana
Vietnam	Dominican Republic	Saudi Arabia	Gambia
Bangladesh	Ecuador	Tunisia	Kenya
India	Guatemala	Turkey	Mali
Sri Lanka	Guyana		Mozambique
Pakistan	Honduras		Malawi
	Jamaica		Niger
	Mexico		Senegal
	Panama		Sierra Leone
	Peru		Togo
	El Salvador		Uganda
	Trinidad and Tobago		South Africa
	Uruguay		
	Venezuela		

*See page 119 on classifications of country: https://www.imf.org/-/media/Files/Publications/WEO/2023/April/English/statsappendix.ashx